CLAIMS

1. A method of determining the coordinates of a feature within an image, the image comprising a plurality of pixels, the method comprising:

determining an estimate of the coordinates of the feature to within a fraction of a pixel;

translating the feature such that the sum of the pixel fraction of the initial estimated coordinates and the pixel translation is an integer value;

determining a further estimate of the coordinates of the translated feature within the image to within a fraction of a pixel; and

summing the pixel fraction of the previous estimate of the coordinates with the further estimate of coordinates to derive a refined estimate of the feature coordinates.

2. A method according to claim 1, wherein the first and second determining steps comprise:

correlating the image feature and image using a predetermined correlation function to determine the coordinates of the feature within the image to the nearest pixel;

evaluating the correlation function at a plurality of pixel positions in the neighbourhood of the determined coordinates and fitting the plurality of values to a further function; and

differentiating the further function to determine its turning point, whereby the coordinates corresponding to the turning point provide the coordinates of the feature to within a said fraction of a pixel.

3. A method according to claim 2, wherein said correlation function is evaluated at a plurality of sub-pixel positions.

4. A method according to claim 3, wherein the sub-pixel positions are in closer proximity to the determined coordinates than the pixel positions.

5. A method according to any preceding claim, the method further comprising:

determining the coordinates of the feature within a further image, the position of the further image being known relative to the first image;

determining the difference in position of the feature between the first and further

image;

superimposing said first and further image such that said feature is substantially in registration; and

applying a Super Resolution technique to said superimposed images, whereby an increased resolution representation of said feature is produced.

6. A method according to any one of claims 2 to 4, wherein said predetermined correlation function comprises a normalised greyscale correlation function.

7. A method according to any preceding claim, wherein the translating step, second determining step and summing step are repeated at least once.

8. A method of measuring dimensional changes in an object, the method comprising:

capturing at least two images of the object, each image being captured at a different time with respect to one another;

determining the position of the object within each image in accordance with the method of any one of claims 1 to 7; and

comparing the determined positions of the object to determine any dimensional changes.

9. Positioning apparatus for determining the position of an object, the apparatus comprising:

an image capture device arranged to provide an image encompassing the object, the image comprising a plurality of pixels; and

an image processor arranged to receive the captured image and determine the position of the object by executing the method steps of any one of claims 1 to 7.

10. Positioning apparatus according to claim 9, further comprising a monitor arranged to receive and display the captured image and object selection means arranged to select an object within the displayed image and identify the selected object to the image processor.

11. Apparatus for detecting dimensional changes in an object, the apparatus comprising:

an image capture device arranged to sequentially provide a plurality of images

encompassing an object, each image comprising a plurality of pixels;

an image processor arranged to sequentially receive the plurality of captured images and determine the position of the object from each image by executing the method steps of any one of claims 1 to 7; and

a position comparator arranged to compare the determined position of the object for each image and determine if the determined position changes between images.

12. Measurement apparatus according to claim 11 further arranged to determine the magnitude and/or direction of the determined change in position.

13. A method of determining the 3-dimensional coordinates of a feature, the method comprising:

providing at least two image capture devices each arranged to capture an image including the feature;

determining the position of each of said image capture devices with respect to one another;

determining the coordinates of the feature within each image in accordance with the method of any one of claims 1 to 7, and calculating the 3-dimensional coordinates of the feature given the determined feature coordinates in each image and the determined relative positions of each image capture device.

14. A method of measuring 3-dimensional changes in an object, the method comprising:

providing at least two image capture devices at a known spatial relationship to one another;

capturing at least two images of the object with each image capture device, the two images being captured at a different time from one another;

determining the 2-dimensional position of the object within each image in accordance with the method of any one of claims 1 to 7;

calculating the 3-dimensional position of the object from the first and second images from the 2-dimensional position and spatial relationship of the image capture devices; and

comparing the 3-dimensional positions to determine any dimensional changes.

15. Position apparatus according to claim 9, further comprising at least one further image capture device at a known spatial relationship to the first image capture device, and wherein the image processor is further arranged to determine the position of the object in the image received for each of the image capture devices and, given the known spatial relationship of the image capture devices, thereby determining the 3-dimensional position of the object.

16. Measurement apparatus according to claim 11 or 12, further comprising at least one further image capture device at a known spatial relationship to the first image capture device, and wherein the image processor is further arranged to determine the position of the object in the image received for each of the image capture devices and, given the known spatial relationship of the image capture devices, thereby determining the 3-dimensional position of the object.

17. A method of determining the coordinates of a feature within an image to within a fraction of a pixel, the image comprising a plurality of pixels, the method comprising:

correlating the image feature and image using a predetermined correlation function to determine the coordinates of the feature within the image to the nearest pixel;

evaluating the correlation function at a plurality of sub-pixel positions in the neighbourhood of the determined coordinates and fitting the plurality of values to a further function; and

differentiating the further function to determine its maximum, whereby the coordinates corresponding to the maximum provide the coordinates of the feature to within said fraction of a pixel.

18. A method of monitoring an aircraft structure, the method comprising the steps of attaching one or more image captures devices to a first portion of an aircraft structure, attaching one or more targets to a second portion of the aircraft structure, the or each target being within the field of view of the or each image capture device, capturing a series of images from the or each image capture device and processing the captured images to determine the magnitude and/or direction of movement of the or each target.

19. A method according to claim 18, wherein said method comprises attaching at least three targets to the second portion of the aircraft structure at known relative positions to

the second portion of the aircraft, the at least three targets being within the field of view of the or each image capture device, whereby the position and orientation of said second portion of the aircraft relative to the or each image capture device is determined by said processing step.

20. A method according to claim 18 or 19, wherein the or at least one of the targets is orthogonally offset from the plane of the second portion of aircraft structure to which it is attached.

21. A method according to claim 18 or 19, wherein a reflective surface is attached to the aircraft structure such that at least one of said targets is within the field of view of at least one of said image capture devices when viewed through said reflective structure.

22. A method according to any one of claims 18 to 21, wherein the or each image capture device is arranged to automatically identify the or each target as an item of interest.

23. A method according to any one of claims 18 to 22, wherein the processing step comprises the method of any one of claims 1 to 8, 13, 14 or 17.

24. A method according to any one of claims 18 to 23, wherein the aircraft structure comprises a portion of a wing, empennage or fuselage.

25. An aircraft structure monitoring apparatus comprising:

at least one image capture device arranged to be attached to a first portion of an aircraft structure;

at least one target arranged to be attached to a second portion of the aircraft structure, whereby the at least one target is within the field of view of the at least one image capture device; and

an image processor arranged to receive a plurality of images from the at least one image capture device and process said received images to determine the magnitude and/or direction of movement of the at least one target.

26. An aircraft structure monitoring apparatus according to claim 25, wherein at least one first further target is arranged to be attached in a plane orthogonally offset from the plane in which the at least one target is arranged to be attached.

27. An aircraft structure monitoring apparatus according to claim 25, wherein a reflective element is arranged to be attached to the second portion of the aircraft structure such that said at least one target is within the field of view of said at least one image capture device when viewed through said reflective surface.

28. An aircraft structure monitoring apparatus according to claim 25, 26 or 27, wherein said image processor is arranged to automatically identify the least one target.

29. An aircraft structure monitoring apparatus according to any one of claims 25 to 28, wherein the or each target comprises an illuminated panel including areas of differential illumination.

30. An aircraft structure monitoring apparatus according to any one of claims 25 to 29, further comprising a plurality of image capture devices and/or a plurality of targets.

31. An aircraft structure monitoring apparatus according to claim 30, wherein said image processor is arranged to execute the method of any one of claims 1 to 8, 13, 14 or 17.